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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

Aspen Grove Use by Deer, Elk, and Cattle in Southwestern Coniferous Forests

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Aspen groves within mixed conifer forests produce more herbaceous understory than adjacent forest. Thinning aspen groves improves herbaceous understory and aspen regeneration. Higher deer and cattle use of aspen groves is associated with the greater abundance of understory vegetation.

Introduction

When mixed conifer forests of the Southwest are disturbed by fire, insect attacks, or logging, aspen sprouts are released. If forest growth is severely

damaged, dense stands of aspen may subsequently develop. Normally, coniferous reproduction gradually establishes beneath aspen stands and eventually replaces them. Aspen stands in various stages of replacement are fairly common in coniferous forests of the Southwest (fig. 1A).

This report suggests the relative importance of aspen groves in mixed conifer forests to elk, deer, and cattle. Such knowledge should be helpful in designing habitat improvement measures for multiple use management of these lands.

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Figure 1.--Character of aspen groves studied:

Dispersion of aspen groves in a mixed conifer forest.

Interior view of unthinned aspen grove, Apache National Forest.



Areas and Methods

The study was conducted on the Apache and Coconino National Forests in Arizona. On the Apache National Forest, five natural aspen groves from 15 to 22 acres in size were studied (fig. 1B). Aspen groves were checked against adjacent stands of mixed conifer forest at a distance of about one-fourth mile.

On the Coconino National Forest, three aspen groves were studied. About half of each grove had been thinned 2 growing seasons previous in an attempt to improve both aspen regeneration and understory forage production. Unthinned portions of these aspen stands were used as check plots.

From 8 to 11 sample plots were established at random in each natural or thinned aspen patch and in each adjacent check area, for a total of 54 plots on the Coconino Forest and 90 plots on the Apache Forest. Basal area of trees was determined with a wedge prism. Aspen sprouts were counted on 1/10-acre plots, pellet groups on 1/50-acre plots; weight of herbaceous plants was estimated by double-sampling on 96-square-foot plots. Significance of sampling differences was tested by a simple "t" statistic.

Although the same species of trees were found in aspen groves as in adjacent coniferous forests (table 1), there was lesser basal area of conifers and greater basal area of aspen in the aspen groves. Similarly, the same tree species were present on unthinned as on thinned aspen plots, with lesser basal area on the latter.

Understory Production

Apache National Forest.—Herbaceous vegetation beneath aspen groves differed from that beneath mixed conifer forests in both amount and variety of species (table 2). The most abundant herbaceous species associated with mixed conifer forests were: brome grass and Arizona fescue among the grasses, the fleabanes, vetches, geraniums, and strawberries among the forbs. All of these species were found also in aspen groves. Bromegrasses, miscellaneous grasses, and vetch were outstandingly more abundant in aspen groves. Also, number of species was greater in the aspen groves, although these miscellaneous species were not individually important in the herbaceous composition. Aspen groves produced a statistically significant difference of about 14 times

Table 1.--Basal area of overstory trees on study areas on the Apache and Coconino National Forests

Tree species	Apache		Coconino	
	Unthinned aspen	Conifer forest	Unthinned aspen	Thinned aspen
- - - - Square feet per acre - - - -				
Quaking aspen <i>Populus tremuloides</i> Michx.	156	21	299	42
Douglas-fir <i>Pseudotsuga menziesii</i> (Mirb.) Franco	7	44	--	--
Subalpine fir <i>Abies lasiocarpa</i> (Hook.) Nutt.	13	46	--	--
Engelmann spruce <i>Picea engelmannii</i> Parry	13	39	--	--
Ponderosa pine <i>Pinus ponderosa</i> Lawson	--	--	131	67
Gambel oak <i>Quercus gambelii</i> Nutt.	--	--	30	13
Total	189	150	460	122

Table 2.--Comparison of herbaceous understory in mixed conifer forests with included aspen groves on the Apache National Forest

Species	Aspen grove	Mixed conifer forest
- - Pounds per acre - -		
<u>PERENNIAL GRASSES AND SEDGES:</u>		
Arizona fescue	15	5
<i>Festuca arizonica</i> Vasey		
Bromegrass	95	10
<i>Bromus</i> spp.		
Others	100	¹ T
Total	210	15
<u>FORBS:</u>		
Agoseris	T	T
<i>Agoseris</i> spp.		
Fleabane	35	25
<i>Erigeron</i> spp.		
Geranium	5	5
<i>Geranium</i> spp.		
RockyMountain iris	5	0
<i>Iris missouriensis</i> Nutt.		
Swertia	5	T
<i>Swertia</i> spp.		
Thistle	T	0
<i>Cirsium</i> spp.		
Vetch	175	15
<i>Vicia</i> spp.		
Western yarrow	T	T
<i>Achillea lanulosa</i> Nutt.		
Wild strawberry	5	5
<i>Fragaria ovalis</i> (Lehm.) Rydb.		
Others	15	10
Total	245	60
- - Number per acre - -		
<u>SPROUTS:</u>		
Quaking aspen	94	219
<i>Populus tremuloides</i> Michx.		

¹ T = Trace.

the yield of grasses and about 4 times the yield of forbs as mixed conifer forests.

Aspen sprouts were more abundant beneath mixed conifers than within aspen groves. The greater abundance of sprouts under the forest may be the result of heavier grazing in aspen stands by both deer and cattle. Dropping groups of these animals were more numerous in aspen stands.

Coconino National Forest.—Thinned stands of aspen on the Coconino National Forest produced

more herbaceous understory than unthinned stands. Bromegrass and Kentucky bluegrass (*Poa pratensis* L.) responded most to thinning among the grasses, and geraniums and swertia among the forbs. Compared to unthinned stands, thinned stands of aspen produced more than three times the yield of perennial grasses and about two times the yield of forbs. Production of aspen sprouts was stimulated by thinning, particularly where root systems were severed by soil disturbance (fig. 2).

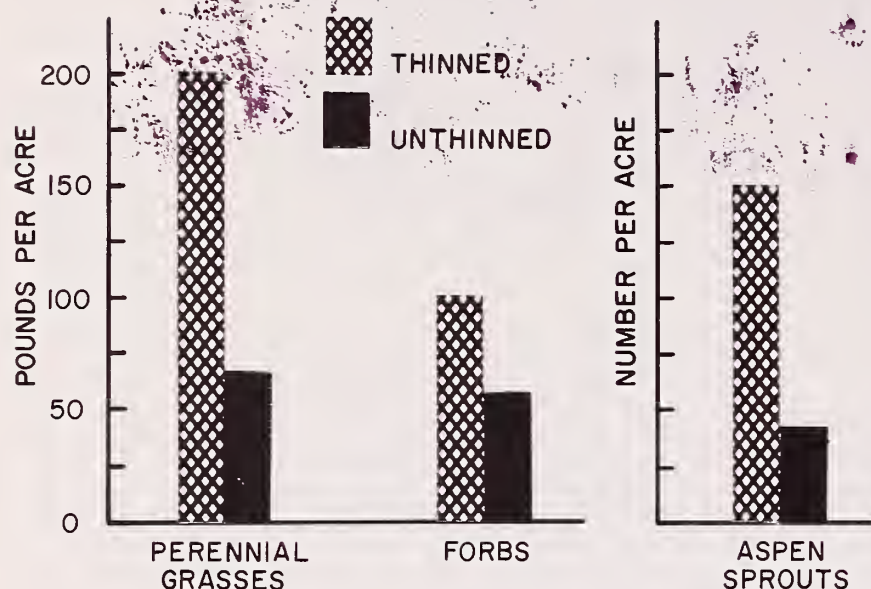


Figure 2.--
Comparative production of perennial grasses, forbs, and aspen sprouts in thinned and unthinned aspen groves, Coconino National Forest, Arizona. (Differences are statistically significant.)

Game and Livestock Use

Estimates of comparative use of aspen groves by deer, elk, and cattle were based upon counts of accumulated dropping groups. Dropping groups of deer and cattle were more abundant in aspen groves on the Apache National Forest than in adjacent mixed conifer forests; differences in numbers of elk dropping groups were not significant statistically:

	Dropping groups per acre	
	Aspen	Mixed conifer
Deer	176	107
Cattle	129	31
Elk	38	33

The thinned plots of aspen were not utilized as much as unthinned plots, as measured by dropping groups, in spite of more forage. When the aspen plots were thinned, fallen trees created barriers to use by cattle. These barriers permitted aspen sprouts to develop without browsing, and allowed the herbaceous understory to recover without grazing. The fallen trees proved as effective barriers for deer and elk as for cattle. Comparative numbers of dropping groups on thinned and unthinned plots on

the Coconino Forest, where elk populations exceeded those of the Apache Forest, were:

	Dropping groups per acre	
	Thinned plot	Unthinned plot
Deer	60	90
Cattle	90	130
Elk	140	290

Conclusions

1. Aspen groves within mixed conifer forests of Arizona yielded about six times more understory herbaceous plants than adjacent mixed conifer forests.
2. Thinning patches of aspen and associated coniferous reproduction in ponderosa pine forests to about three-fourths basal area produced about 2½ times as much herbaceous understory and increased production of aspen sprouts by 4 times.
3. Deer and cattle use, but not elk use, was greater within natural aspen groves, as measured by accumulated pellet group counts.
4. Fallen timber in the thinned aspen plots prevented deer, elk, and cattle from completely utilizing the more abundant forage therein.
5. Preserving or providing for an interspersed of aspen groves in a mixed conifer forest and encouraging existing aspen groves in ponderosa pine forests should effectively improve habitat for deer.